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Many of the metal parts of the five-foot reflector mounting are much too large to be machined in the observatory shop. These large parts are being made by the Union Iron Works Company of San Francisco; they comprise a very large proportion of the total weight of the mounting, and include the base casting, in two sections, the south and north bearings for supporting the polar axis, the polar axis, the float, the mercury trough, the fork, the short cast-iron part of the tube, the declination trunnions, the ten-foot worm-gear, the seven-foot bevel-gear, and some other minor parts. The polar and declination axes are hollow nickel-steel forgings, oil-tempered; they were hydraulic-forged, tempered, and rough-turned by the Bethlehem Steel Company, of Bethlehem, Pa., and are being finished at San Francisco by the Union Iron Works Company, all of the cylindrical surfaces being ground. It is expected that the Union Iron Works Company will finish their part of this work in three or four months from the present date. The heavy parts of the mounting will then be assembled at the observatory shop in Pasadena, where it will be necessary to construct a special temporary iron building, with a powerful crane for the purpose of erecting the mounting, as it seems indispensable that the instrument be completed, set up, and thoroughly tested in every way before being taken up the mountain.

All of the smaller and more complicated parts of the mounting will be constructed in our own shop, and this work is already well under way. These parts include the driving-clock and clock connections, the motor connections for quick and slow motions in right ascension and declination, the skeleton tube with interchangeable ends, the mirror cells, with the support systems for the mirrors, etc. The cutting and grinding of the teeth of the ten-foot worm-gear will also be done here.

G. W. RITCHEY.

SOLAR OBSERVATORY OFFICE, PASADENA.

THE ORBITS OF VISUAL BINARY STARS.

In *Lick Observatory Bulletin* No. 84 I have given the results of a study of all published double-star orbits. This paper will be of interest primarily to double-star observers, as it consists mainly of a table of the best orbit data (in my judgment) of those stars for which fairly satisfactory orbits have been computed, and of notes showing the agreement of the predicted places with the most recent available observations.

Some general statements and conclusions based upon this paper and the study of which it is the result may be of wider interest.

It appears that orbits have been computed (or at least published) for only ninety-one different binary systems, restricting this term to the visual double stars,—that is, systems both of whose components have actually been seen in the telescope. Many of these orbits are based upon observed arcs so short or upon data of such doubtful value that they amount to no more than simple guesses, and are practically worthless. In fact, even by straining the definition of the term pretty badly, I was only able to say that fifty-three systems had "fairly satisfactory" orbits. These fifty-three orbits vary widely in value; many are still very uncertain, and of only thirty, or at most thirty-five, can it be said with reasonable confidence that future observations are unlikely to make necessary any great change in the elements.

The two double-star systems of which we have the most knowledge are those of α *Centauri* and *Sirius,* our two nearest neighbors among the stars; for not only do we possess very accurate orbits of these pairs based upon micrometric measures, but we also have relatively very exact values of the parallax of these two stars.

So far as accurate orbits are concerned, our knowledge of several other systems—e. g. ξ *Ursæ Majoris,* 42 *Comæ Berenices,* κ *Pegasi,* and δ *Equulei*—is also very satisfactory, and good observations for the next ten years will make it possible to say the same of nearly all the shorter-period binaries given in my list. When it comes to the orbits with periods of one hundred years or more, we must, for the most part, be content with a much slower rate of progress, and many of the long-period orbits must remain uncertain for one or more centuries.

Nor can we hope to make many additions to our list from the binaries in the Σ and OΣ catalogues for which no orbits have as yet been computed. In general these binaries have long periods, and the observed arcs are still very short, and nothing is more clearly demonstrated by the orbits hitherto published than the futility of trying to determine a good double-star orbit from a short observed arc. It is seldom indeed that observations covering an arc of less than 180° will yield a reliable orbit, and it is safe to say that for most double stars an observed arc of at least three quadrants is necessary.

The number of well-determined binary-star orbits will be increased most rapidly by careful and systematic observations of the stars that have already shown considerable motion,—especially such pairs as β 80, β 513, β 648, Ho 212 etc,—and of the very close pairs of more recent discovery.

November 6, 1905. R. G. AITKEN.

OBSERVATIONS OF THE ECLIPSES OF *SATURN'S* SATELLITES.

More than a year ago Professor HERMANN STRUVE called attention* to the "cycle of eclipses and other phenomena of the satellites of *Saturn*" which began in 1904 and will extend over the next three years, but I have seen, so far, no published record of any observations of these eclipses. The following data may therefore be of interest:—

1905, Oct. 18; 36-inch telescope, power 350. Reappearance of *Enceladus* from eclipse noted at $15^h\ 16^m\ 40^s$ G. M. T. Predicted time,* $15^h\ 15^m$ G. M. T.

The time was noted when the satellite was seen with certainty. It was suspected nearly 2^s earlier. The sky background was good, but the seeing only fair, the images blurring badly at times.

1905, Oct. 26; 36-inch telescope, power 350. Reappearance of *Tethys* noted at $15^h\ 30^m\ 21^s$ G. M. T. Predicted time,* $15^h\ 29^m$ G. M. T.

Tethys was dimly seen for 5^s before the time noted. Observing conditions about as on Oct. 18.

1905, Nov. 10; 36-inch telescope, power 350. Reappearance of *Tethys* noted at $18^h\ 5^m\ 17^s$ G. M. T. Predicted time,* $18^h\ 4^m$ G. M. T.

The planet was low in the sky at the time of observation, and the seeing not very good. The time noted is the instant the satellite was dimly seen.

On October 28th, and again on November 14th, I tried to

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* *Mon. Not. R. A. S.*, Vol. LXIV, p. 813, et seq, 1904.